



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|--------------------------|-------------------------------|------------------------|
| 10/523,101 | 02/01/2005 | Liliana Bagala' Rampazzo | 09931-00035-US | 8413 |
| 23416 7590 09/18/2007 CONNOLLY BOVE LODGE & HUTZ, LLP P O BOX 2207 WILMINGTON, DE 19899 | | | EXAMINER NELSON, MICHAEL E | |
| | | | ART UNIT 1709 | PAPER NUMBER |
| | | | MAIL DATE 09/18/2007 | DELIVERY MODE PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|--|--|
| Office Action Summary | Application No. 10/523,101 | Applicant(s) BAGALA' RAMPAZZO ET AL. | |
| | Examiner Michael E. Nelson | Art Unit 1709 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21,25,26,28 and 29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20,25-26,28-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>02/01/2005</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:
2. On page 18, paragraph [0155], several words in the NMR characterization portion have been lost, replaced with squares, likely due to misconversion of fonts.

Appropriate correction is required.

Claim Objections

3. Claims 18 is objected to because of the following informalities:
4. In Claim 18, the phrase "according to claim 1 in a mixture of them as enantiomers" should be corrected to "according to claim 1 as a mixture of enantiomers."
5. Appropriate correction is required.

Claim Rejections - 35 USC § 112

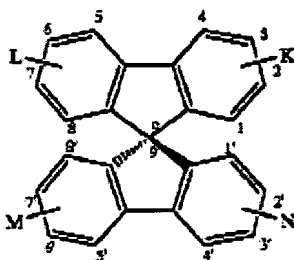
6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Art Unit: 1709

7. Claims 1-5 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for 2,2',7,7'-acyl substituted spirobifluorenes, does not reasonably provide enablement for acyl substituents at other positions. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.

8. Applicant claims compounds of the following structure, where K-M can be the same or different and where K-M can each be H or A-C=O, but where all of K-M are not H. The structure indicates substitution at all the available positions of the spirobifluorene structure.



9. Applicants provide two synthetic methods for making the compounds of the invention. The first involves a direct electrophilic acylation of the spirobifluorene ring system, and the second involves electrophilic acylation of an aromatic ring by an acyl halide made from the spirobifluorene compound. The precursor to the acyl halide of the spirobifluorene compound is an acyl substituted spirobifluorene compound, which is made by direct electrophilic acylation of the unsubstituted spirobifluorene.

Art Unit: 1709

10. However, the nature of the spirobifluorene structure, and the relative reactivities of each of the positions of the ring does not allow for electrophilic acylation of any position other than 2, 2', 7, and 7'. By definition, since the molecule is symmetric the first substitution occurs at the 2 position, followed by the 2' position, or 7' position, depending on the stereochemistry of the product. The other positions of the spirobifluorene ring system can only be functionalized by electrophilic reactions **after** all of the 2, 2', 7, and 7' positions have been functionalized.

11. The electrophilic acylation of spirobifluorene is described by Lupo et al. (5,840,217). Lupo et al. disclose the synthesis of 2 acetyl, 2,2' diacetyl, 2,2',7-triacetyl, and 2,2',7,7'-tetraacetyl spirobifluorene compounds, using acetyl chloride and $AlCl_3$. They also synthesize 2,2',4,4',7,7'-hexabromo spirobifluorene by exhaustive bromination (a different electrophilic reaction), and show therefore that the other positions of the spirobifluorene ring system do not react until after the reaction is complete at all of the 2,2',7 and 7' positions.

12. Applicant does not provide a synthetic method for any compound substituted at any position other than the 2,2',7 or 7' position, while maintaining a hydrogen atom at each of those positions.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

Art Unit: 1709

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 1-21, 26, 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lupo et al. (5,840,217) with evidence supplied by Towle (4,898,983).

15. Concerning claims 1-17, Lupo et al. describe the synthesis and preparation of 9,9'-spirobifluorene compounds for use in electroluminescent devices. Lupo et al. specifically detail the synthesis of acetyl derivatives of 9,9'-spirobifluorene, particularly 2,2'-diacetyl-9,9'-spirobifluorene based on electrophilic acylation of 9,9'-spirobifluorene (column 27, Lines 5-22). Lupo et al. further details that the 2,2',7'-triacetyl-9,9'-spirobifluorene and 2,2',7,7'-tetraacetyl-9,9'-spirobifluorene are synthesizable by control of the stoichiometry of the reaction. Though Lupo et al. do not specifically mention formation of the 2-acetyl-9,9'-spirobifluorene, based on the control of the stoichiometry proposed by Lupo et al., it would also have been obvious to one of ordinary skill to reduce the amount of acetyl chloride in the reaction to produce the mono-substituted 9,9'-spirobifluorene.

16. Based on the synthetic method described by Lupo et al., it would have been obvious to one of ordinary skill in the art to substitute well-known aryl chlorides instead of acetyl chloride in the electrophilic acylation reaction to produce aryl substituted 9,9'-spirobifluorene analogs. For example, Towle (4,898,983) describes the use of electrophilic acylation reactions for forming aryl carbonyl compounds, and specifically mention the use of acetyl chloride, or aryl chlorides such as 4-fluorobenzoyl chloride, and 4-hydroxybenzoyl chloride (column 4, lines 3-8).

Art Unit: 1709

17. Since Lupo et al. utilize the 9,9'-spirobifluorene compounds in an electroluminescent device, the compounds are known to be electrically conducting. In such a device, electrons are injected into the material, by definition producing the radical anion of the material. As such, the radical anions of the compounds are an obvious variant of the compounds themselves, since they are used as materials in electrical devices.

18. Concerning claim 18-19, Lupo et al. describe the synthesis of mono, di, tri, and tetra substituted compounds as discussed above. Lupo et al. does not specifically mention the separation of enantiomers after synthesis, so the compounds would be present as a mixture of enantiomers. However, resolution of enantiomeric mixtures is well known in the art. Therefore, it would have been obvious to one of ordinary skill in the art to resolve the enantiomeric mixture into optically pure enantiomers using standard techniques, including chiral HPLC, or chiral derivatization.

19. Concerning claim 20, Lupo et al. describe the method used to synthesize the 9,9'-spirobifluorene compounds by reacting an the unsubstituted 9,9'-spirobifluorene with acetyl chloride in the presence of AlCl_3 (Lewis Acid) in CS_2 as solvent, at reflux temperature.

20. Concerning claim 21, Lupo et al. describe the acyl-chloride functionalized 9,9'-spirobifluorene compound (column 32, lines 31-40). The formation of aromatic carbonyl compounds by the reaction of acyl halides with aromatic compounds in the presence of Lewis acids is a well known process (as evidenced by Towle), it would have been

Art Unit: 1709

obvious to one of ordinary skill in the art to synthesize the aroyl substituted 9,9'-spirobifluorene compounds by electrophilic acylation of an aromatic compound by an acyl halide functionalized 9,9'-spirobifluorene compound.

21. Concerning claim 26 and 28, Lupo et al. describe the use of 9,9'-spirobifluorene compounds in electroluminescent devices. While the specific acetyl substituted compounds are not specifically used by Lupo et al. in the electroluminescent device, Lupo et al. describe the utility of many 9,9'-spirobifluorene compounds, including unsubstituted 9,9'-spirobifluorene compounds, as materials for electroluminescent devices. Based on the general teaching by Lupo, et al. it would have been obvious to one of ordinary skill in the art to test the aroyl-functionalized 9,9'-spirobifluorene compounds as materials for electroluminescent devices.

22. Concerning claim 29, Lupo et al. describe the synthesis of the multi-acetyl substituted 9,9'-spirobifluorene compounds, as discussed above. Lupo et al. also describe the conversion of those multi-acetyl substituted compounds into multi-carboxyl substituted compounds, (column 27, lines 27-41). Lupo, et al. also disclose the conversion of the di-carboxyl-9,9'-spirobifluorene compounds into the di-acylchloride substituted 9,9'-spirobifluorene. (Column 32, lines 31-40) Based on the method described by Lupo et al. it would have been obvious to use the same conditions to convert the known multi-carboxyl substituted compounds into the multi-acylchloride substituted compounds.

Art Unit: 1709

23. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lupo et al. as applied to claim 1-21, 26, 28-29 above, and further in view of Pedersen et al.

(Journal of Electroanalytical Chemistry, vol. 454, pp. 123-143, 1998).

24. Concerning claim 25, Lupo et al. describe the acyl substituted 9,9'-spirobifluorene compounds as discussed above, but are silent on the method of production of the radical anion of the compounds.

25. Pedersen et al. describe the production and measurement of radical anions of several aromatic compounds, and describe the method as electrochemically generating, by supplying an electrical potential, a radical anion of a 2-6 mM solution of aromatic compound in a solution of 0.1M TBABF₄ (tetrabutylammonium tetrafluoroborate, a supporting electrolyte) in DMF (page 125). The solution of TBABF₄ in DMF was dried (made anhydrous) prior to each experiment (page 124).

26. It would have been obvious to one of ordinary skill in the art to use a general method for preparing and measuring radical anions as described by Pedersen et al. on compounds as described by Lupo et al. for the purpose of measuring and analyzing the radical anions formed in an electronic device.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael E. Nelson whose telephone number is 571-270-3453. The examiner can normally be reached on M-F 7:30am-5:00pm EST (First Friday Off).

Art Unit: 1709

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on 571-272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Michael E. Nelson
Examiner
Art Unit 1709


D. LAWRENCE TARAZANO
PRIMARY EXAMINER